

# **Mt. Mansfield Amphibian Monitoring**

# Amphibian Monitoring on Mt. Mansfield, Vermont 1993-2016/7

## Background

After an initial amphibian survey and establishment of monitoring protocols, populations of amphibian species have been monitored almost annually on Mount Mansfield since 1993. The goals of the monitoring are to (1) establish a baseline data set of abundance indices for the amphibian species caught in the fences, (2) monitor year-to-year changes in their abundance indices, (3) monitor changes in the number and type of obvious external abnormalities, (4) gather inventory data for the Vermont Herp Atlas, and (5) gather basic natural history information on the species present. Amphibians are targeted for this kind of study because their multiple habitat usage and permeable skin make them especially sensitive to changes in environmental conditions. This is the longest-running set of amphibian monitoring data in the state.

Four drift fences were built at three elevations on the west slope of Mt. Mansfield: 1200 feet (2 fences), 2200 feet (1), and 3200 feet (1). With the exception of the fence at 3200 ft., each fence was made of two 50-foot sections of 20-inchwide metal flashing buried 4 inches below the surface of the ground. The two sections were placed at right angles to each other, resulting in 100 feet of flashing set upright as a 16-inch-high fence. Buckets were buried every 12.5 feet on both sides of the fence so that the top edges of the buckets were flush with the ground. The fence at 3200 feet was made of only one 50-foot section of flashing with buckets at 12.5-foot intervals. Amphibians that encounter a fence while moving through the forest must turn to one side and many eventually fall into a bucket. The lids are taken off the buckets in the late afternoon on rainy days, and the captured amphibians identified and counted the followi

We have drift-fence data from Mt. Mansfield from 1993 to the present, with the exceptions of 2004, 2009, 2015, and April and May of 2016. We also collected data from fences near the Lye Brook Wilderness in southern Vermont annually from 1994 through 2002 when funding ended. During 2008 monitoring began again at Lye Brook Wilderness and continued at Mt. Mansfield as well. Periodic monitoring at Lye Brook allows us to compare data at the two locations to see if there are corresponding patterns that may signal statewide changes. In 2009 only the Lye Brook Wilderness fences were monitored, and in 2010 only Mt. Mansfield fences were monitored. In the fall of 2011, Hurricane Irene washed out the road leading to the Lye Brook drift fences, preventing data collection in the fall of 2011 and in 2012. Prior to monitoring at this site again a new road allowing access from Manchester needed to be completed (now completed). We would also need to locate and train new staff and find funding. Due to an anticipated break in the funding the drift fences were removed from Mt. Mansfield during the summer of 2015. Luckily, funding was restored, the fences were reinstalled in May of 2016 and data collection began in June of 2016.

As per a former contract with the State of Vermont, in 2009 it was agreed that amphibian and reptile monitoring and survey data would continue to be gathered, reviewed, entered into our database, and forwarded to the Forest Ecosystem Monitoring Cooperative. However, in an effort to save money and time, we agreed at that point to begin an every-other-year schedule of generating indices, analyzing, and reporting on the data gathered. Consequently, the 2009 report included basic background information and a very brief review of the survey data. The 2010 report included new data gathered from Lye Brook in 2009 and Mt. Mansfield in 2010. The 2012 report included all data from 1993 through 2012. The report in May of 2015 contained all data from 1993 through 2014. No data were collected in 2015 or April or May of 2016. This report includes all data from 1993 through June of 2017 from Mt. Mansfield.

Due to the re-installation of the fences in the summer of 2016, no data were collected in April and May 2016. In order to be able to continue comparing year-to-year results we needed to have a full year of results, including a spring migration in April and May. We chose to include the data collected during April and May 2017, as it was the closest chronologically to the 2016 field season and encompasses one full year. For the rest of this report, when we refer to amphibian data collected in 2016 in the figures and tables, we are including those two months of data from 2017. Clean and updated sets of all the drift-fence data from Mt. Mansfield, including data not used in our indices have been sent to FEMC.

### **Diversity of Adults and Young**

In 2016/17 all the usual caudate (salamander) species were caught as adults, including Spring Salamanders (*Gyrinophilus porphyriticus*). Young of all of these salamander species except Northern Dusky (*Desmognathus fuscus*) and Spring Salamanders were also caught.

In 2016/17 all adult anurans (frogs) were found, but no young American Toads (*Anaxyrus americanus*), Pickerel Frogs (*Lithobates palustris*) or Gray Treefrogs (*Hyla versicolor*) were found. Only one juvenile Spring Peeper (*Pseudacris crucifer*) was detected.

### **Long-term Trends**

Linear regressions most closely fit most of the data plots, so they are used to show potential trends in the abundance indices for all species caught from 1993-2016/17 (Figures 2-7).

## Increases

The data gathered show that only the Eastern Red-backed Salamander (*Plethodon cinereus*) shows a significant long-term increase (Figure 6) in our study area.

The regression line for the American Toad (Figure 3) shows a moderate long-term increase but we appear to have started monitoring during a particularly low-population period for that species and after an unusually high peak in 2013, it had a large population drop in 2014 and now shows average numbers.

## Declines

The long-term decline of Spring Peepers (Figure 4) is the only significant decline shown among the species we monitor on Mt. Mansfield. During 2008 and 2010 the Spring Peeper was not detected at all. From 2011 to 2014 adult Spring Peepers were caught once again, and twenty-six were caught in this monitoring period. The increased number of adult Spring Peepers caught during the the 2016/17 monitoring (mostly in early 2017) may signal the beginning of a recovery.

The regression line for Wood Frog (*Lithobates sylvaticus*) suggests a decline (Figure 4), but if we had started monitoring a year later, that would not be the case. It has large annual variation.

The Eastern Newt (*Notophthalmus viridescens*) regression line (Figure 5) suggests a long-term decline but it is currently at peak numbers and it is also a species that has shown large annual variation.

Overall, the total number of salamanders and frogs detected per trapping is lower than last year but fairly high when measured against the last twenty-three years at Mt. Mansfield. The National Weather Service reported that 2016 was the ninth driest year on record in Vermont. However, our data include two months from the wet spring in 2017 and that has increased trapping rates.

## **Young of the Year**

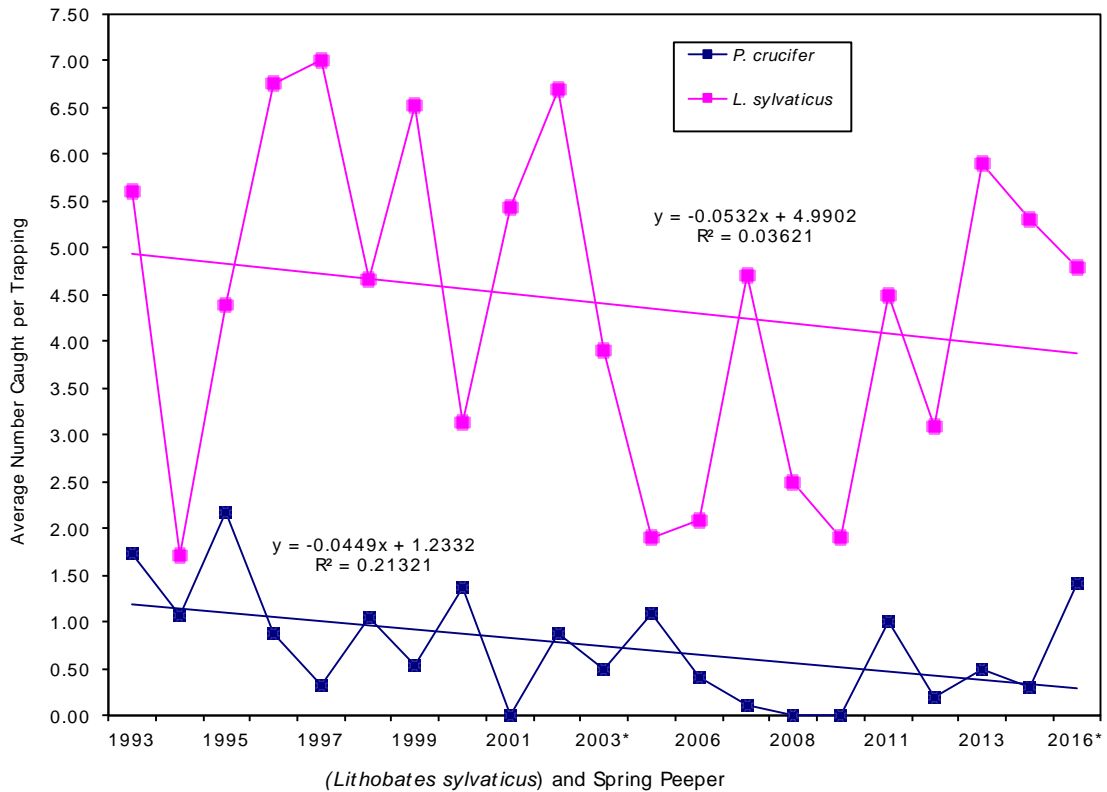
Beginning with the 1995 report we began calculating the number of young of the year, the percentage of young of the year (YOY), and recording the date of the first metamorph found in a drift fence. The cutoff lengths listed on Table 1 were calculated in 1995, based on data we had collected and information gathered from the literature. As mentioned in the footnotes, in addition to using the total length as one cutoff for determining young of the year, we also use dates, as some larvae or tadpoles may overwinter in their aquatic phase and metamorphose in the early spring. In 2016, young of the year made up 10% of those caught (Table 1). This is the lowest percent YOY ever. Over the course of the entire study (1995 – 2016/17) the average percentage of young of the year of total catch was 27.6%. Since the study's inception the young of the year have varied from 10% (2016/17) to 74% (2002). Table 3 and Table 4 summarize the young of the year information for salamanders and frogs respectively.

All frogs monitored except for Green Frogs generally grow from egg to metamorph in one season. At this latitude and elevation, Green Frogs usually spend at least one winter as a tadpole and metamorphose a year or more after the eggs are laid. Other frogs metamorphose during the same year as egg laying but at a very small size. American Toads can be as small as 8-13 mm after metamorphosis. Gray Treefrogs (*Hyla versicolor*) can be as small as 15 mm. Wood Frogs can transform as small as 10-20 mm and Spring Peepers as small as 13 mm. It is possible that a froglet may have transformed in a previous year but still be under the cut-off size to be considered young of the year when found the following spring. Therefore, when determining young of the year we did not include small frogs or toads found in spring or early summer if it was unlikely enough time had passed to allow for development through metamorphosis. Different species of salamanders show even more variability and for many the term *young of the year* is misleading. It would be more accurate for us to say *first year of their*









### Eastern Newt

The trapping rate for the Eastern Newt is currently at an all time high of 1.9 per trapping. The long-term trend still shows a downward regression line, but given the high current numbers and the large annual variation, that line could shift in the next couple years. As a result we are not currently concerned about the suggested trend.





such as a Spring Peeper or Wood Frog. At this site the Spotted Salamander breeds in the same pools as the Wood Frog. Table 3 shows that Spotted Salamander breeding in these pools was fairly successful in 2014 and 2016. They showed 33% and 42% young of the year respectively. In 2016/17 there were a relatively high number of young salamanders caught (11).

One might assume that Wood Frog recruitment should follow similar trends as the Spotted Salamander, but Table 4 shows that recruitment of Wood Frogs does not always change in sync with Spotted Salamander. Wood Frog YOY showed a high in 2003 of 59% when Spotted Salamander YOY were also high at 50% during the same year. In contrast



## Summary

The drift-fence array at Mt. Mansfield has facilitated the longest-running amphibian-monitoring program in the state. It is the only amphibian drift-fence location in Vermont that has been monitored almost continuously from 1993 through 2016. During 2009 monitoring took place only at Lye Brook. Due to budget cuts, we thought 2014 was the last year of monitoring at Mt. Mansfield. Drift fences were removed and marked in the summer of 2015. However, due to restored funding the drift fences were put back in the spring of 2016 and data collection began again in June. Data from these efforts are exported in Excel format and sent via E-mail to FEMC soon after reports are written.

Although we have not used power analysis to evaluate apparent trends in species populations since 2001 (see 2001 VForEM annual report), anyone carefully examining and using our data may well want to do so. However, despite the lack of the more statistically rigorous power analysis recently, the data still show that populations of Spring Peeper had been declining steadily since monitoring began in 1993 through 2010 but they increased significantly in 2016/17. Populations of the Eastern Red-backed Salamander have increased dramatically. Despite recent declines in the past two monitoring years, capture rates are still very high. Life history differences and similarities between species will help us rule out some potential causes of these changes and suggest others, but at this point, little is known about what is driving these changes.



1

Anurans  
(Frogs)

1.58.9

1.6

2.2

9

0.9

1 1



